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PREVENTION OF ATRIAL FIBRILLATION

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Abstract
Atrial fibrillation is one of the most common heart rhythm disorders, associated with a high risk of stroke, heart failure, and mortality. This article reviews the key pathophysiological mechanisms of atrial fibrillation development, risk factors, clinical manifestations, and consequences of arrhythmia. Particular attention is paid to modern prevention strategies, including primary prevention in patients at risk and secondary prevention in individuals with established disease. Recommendations for monitoring blood pressure, body weight, managing concomitant diseases, and approaches to antiarrhythmic and anticoagulant therapy are presented. The role of catheter ablation and cardiac rehabilitation in reducing relapses and improving the quality of life of patients.

Keywords: Atrial fibrillation; arrhythmia; prevention; stroke; anticoagulants; antiarrhythmics ; catheter ablation ; cardiology.

Introduction

Atrial fibrillation (AF), or atrial fibrillation, is one of the most common forms of heart rhythm disorders seen by physicians worldwide. According to the European Society of Cardiology (ESC), the prevalence of AF in the adult population ranges from 1.5% to 2%, with the incidence increasing with age and reaching 10% in people over 80 years of age (ESC Guidelines , 2020). This condition is accompanied by chaotic and ineffective contraction of the atria, which leads to hemodynamic impairment and a significant increase in the risk of thromboembolic complications, including stroke.

Atrial fibrillation is associated with a high mortality rate and a significant decrease in the quality of life of patients. In addition, it increases the costs of the health care system due to frequent hospitalizations, the need for long-term therapy and monitoring of the patient's condition. The most dangerous complication of AF is ischemic stroke, the risk of which increases 4-5 times with this rhythm disorder.

Timely prevention of atrial fibrillation is especially important in the context of an aging population, an increase in the number of patients with cardiovascular diseases, obesity and diabetes. Preventive measures include both primary prevention - preventing the development of AF in people at risk, and secondary prevention - preventing relapses in already diagnosed patients. The aim of this article is to review the key pathophysiological mechanisms of atrial fibrillation, identify risk groups and summarize modern approaches to the prevention of this condition, including pharmacological and non-pharmacological strategies.

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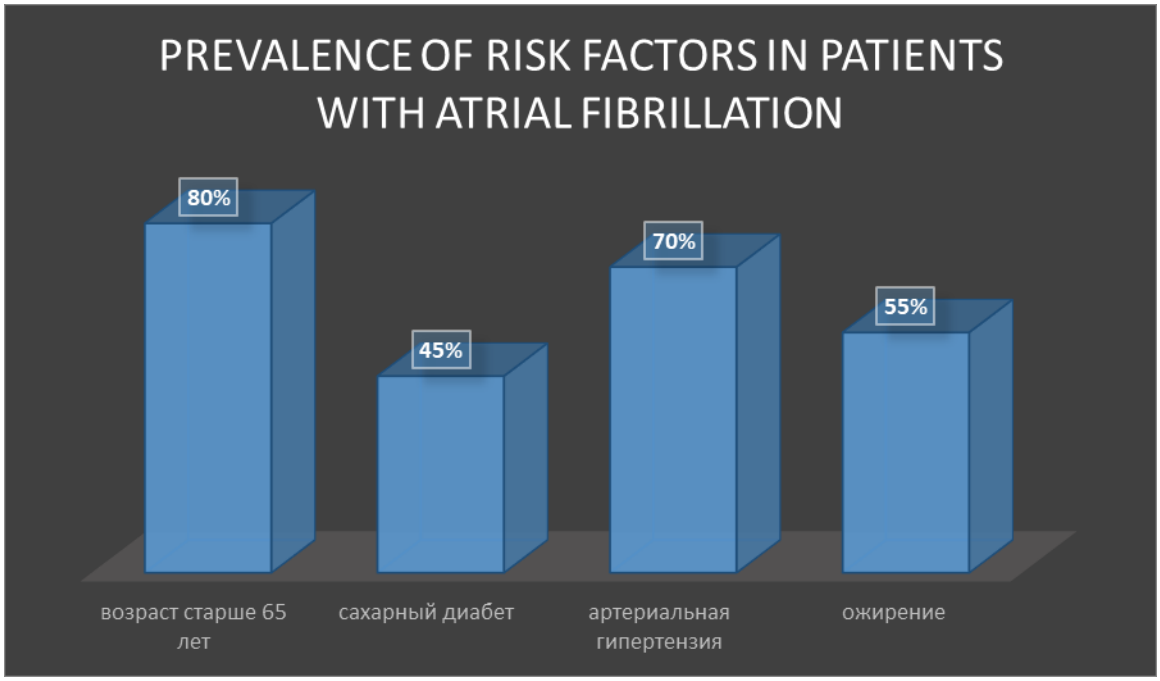
Main part

Etiology and risk factors of atrial fibrillation

Atrial fibrillation develops as a result of complex interaction of structural, electrophysiological and inflammatory changes in the atrial myocardium. Causes of AF can be both cardiac and extracardiac. The most common are arterial hypertension, ischemic heart disease, heart failure, valve defects, especially the mitral valve. Non-cardiac factors include thyrotoxicosis, obesity, chronic obstructive pulmonary disease, alcohol abuse and psychoemotional stress.

With age, the likelihood of fibrotic changes in the atria, their dilation and loss of homogeneity of the conduction system increases. The presence of metabolic disorders, such as type 2 diabetes mellitus, also significantly increases the risk of developing AF. Smoking, physical inactivity and sleep apnea are additional modifiable risk factors.



Explanation of the Diagram

The diagram “Prevalence of risk factors in patients with atrial fibrillation” demonstrates that the largest share of predisposing factors is age over 65 years (80%) and arterial hypertension (70%). Also significant factors are obesity (55%) and diabetes mellitus (45%) . These data emphasize the need for active monitoring and control of the condition of patients with metabolic and vascular disorders, especially in old age, for the purpose of effective primary prevention of atrial fibrillation.

Pathogenesis and mechanism of development

The pathogenesis of AF is based on the disruption of normal electrical activity of the atria with the formation of multiple foci of ectopic activity, most often in the mouths of the pulmonary veins. This leads to a disjointed and chaotic contraction of the myocardial fibers of the atria with a frequency of more than 300-600 impulses per minute. Normally, the atrioventricular node performs the role of filtration, but with long-term AF , remodeling of the node may occur, contributing to the preservation and chronization of arrhythmia.

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The inflammatory component also plays an important role: increased levels of C-reactive protein (CRP), interleukin-6 and other pro-inflammatory markers are associated with a high frequency of AF recurrences. This confirms that chronic inflammation can be not only a consequence, but also a trigger for arrhythmia.

Clinical picture and consequences

Atrial fibrillation may be asymptomatic, especially in the early stages, or may present with complaints of palpitations, irregular heartbeats, weakness, dizziness, shortness of breath, and decreased exercise tolerance. In older patients, AF is often first diagnosed after a stroke or episode of heart failure.

The consequences of arrhythmia are both acute and delayed. The most dangerous complication is thromboembolism, primarily stroke. The formation of blood clots in the left atrial appendage is caused by blood stasis due to the loss of its pumping function. Patients also develop dilated cardiomyopathy , the course of ischemic heart disease worsens and the quality of life is significantly reduced.

Modern approaches to the prevention of atrial fibrillation

Prevention of atrial fibrillation is carried out at two levels: primary - aimed at preventing the development of arrhythmia in individuals from the risk group, and secondary - to prevent relapses in patients with an already diagnosed form of the disease. Both areas require a comprehensive, personalized approach combining drug and non-drug therapy.

Primary prevention

Primary prevention begins with active identification of risk factors in patients over 40 years of age, especially in the presence of arterial hypertension, obesity, diabetes mellitus, hyperthyroidism and a family history of arrhythmia. The main areas of prevention are:

- Blood pressure control : persistent increase in pressure over 140/90 mmHg significantly increases the risk of atrial remodeling . The use of ACE inhibitors and angiotensin II receptor blockers helps reduce the load on the myocardium and has an antiarrhythmogenic effect.
- Correction of body weight and glucose levels : Reducing the body mass index (BMI < 27) and achieving compensation of carbohydrate metabolism can significantly reduce the risk of AF. Studies have shown that losing 10% of body weight reduces the likelihood of developing arrhythmia by almost half (Pathak RK et al ., 2015).
- Thyroid monitoring : Asymptomatic atrial fibrillation is common in subclinical hyperthyroidism, especially in elderly patients. TSH screening is mandatory in all individuals with tachycardia of unknown origin.
- Physical activity : regular aerobic exercise of moderate intensity (walking, swimming, cycling) helps normalize the rhythm and improve vascular regulation. However, excessive physical overload, especially in athletes, can provoke arrhythmia.
- Limiting alcohol and quitting smoking : alcohol abuse, especially in the form of so-called " holiday heart syndrome ", is directly associated with the development of paroxysms of AF.

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Table 1. Measures for the prevention of atrial fibrillation and their therapeutic goal

No.	Preventive measure	Purpose of application
1	Blood pressure control	Reducing myocardial preload and preventing atrial remodeling
2	Reduction of body weight and body mass index	Reducing the mechanical load on the heart and reducing the risk of arrhythmia
3	Treatment of hyperthyroidism	Prevention of ectopic activity and reduction of the likelihood of AF recurrence
4	Quitting smoking and drinking alcohol	Elimination of external triggers of arrhythmia and improvement of overall cardiovascular health
5	Regular physical activity	Maintaining normal rhythm and vascular tone, reducing inflammation
6	Antiarrhythmic therapy	Maintenance of sinus rhythm, control of relapses and relief of attacks
7	Anticoagulant therapy	Prevention of stroke and thromboembolic complications
8	Catheter ablation	Elimination of sources of arrhythmia and restoration of normal heart rhythm

Secondary prevention

Secondary prevention is aimed at reducing the frequency of relapses and preventing complications in patients with established AF. The most important components of secondary prevention are:

- Antiarrhythmic therapy : depending on the form of AF (paroxysmal, persistent , permanent), drugs of classes I and III are used: propafenone , flecainide , amiodarone , sotalol . The choice of drug depends on the presence of structural heart disease and the risk of side effects.
- Ventricular rate control : If restoration of sinus rhythm is not possible, the goal of therapy is rate control. Beta blockers, non-dihydropyridine calcium antagonists (verapamil , diltiazem) and cardiac glycosides are used.
- Anticoagulant therapy : risk stratification according to the CHA_2DS_2- VASc scale is used for stroke prevention . Patients with 2 or more points are recommended to take oral anticoagulants - warfarin or new oral anticoagulants (NOAC): apixaban , dabigatran , rivaroxaban .
- Catheter Ablation : In patients with symptomatic recurrent AF that is refractory to drug therapy, radiofrequency ablation of the pulmonary vein orifices is an effective method. It maintains sinus rhythm in 70–80% of cases.
- Cardiac rehabilitation : medical supervision, weight control, cessation of alcohol and tobacco, psychotherapeutic support, participation in a “patient school” increase adherence to treatment and reduce the risk of relapse.

Thus, prevention of atrial fibrillation requires a systematic approach and coordination of efforts of cardiologists, therapists, endocrinologists and the patients themselves. Success is possible only with the active participation of the patient and timely intervention at all stages of the disease.

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Conclusion

Atrial fibrillation is a serious medical and social problem of the 21st century. High prevalence, severe complications and significant reduction in quality of life make this condition the object of close attention of doctors of various specialties. As shown in this article, atrial fibrillation develops against the background of many risk factors, including arterial hypertension, obesity, diabetes, inflammatory processes and age-related changes in the atrial myocardium.

Understanding the mechanisms of development and early identification of patients at risk allows for effective implementation of primary prevention measures. This includes lifestyle modification, blood pressure and body weight control, treatment of endocrine disorders, limiting alcohol consumption and stopping smoking. Secondary prevention aimed at reducing the frequency of relapses, preventing thromboembolic complications and maintaining sinus rhythm using drug therapy or invasive interventions is no less important.

Thus, prevention of atrial fibrillation should be a priority in cardiology and general therapy. A comprehensive and individualized approach based on interdisciplinary interaction and active participation of the patient can significantly improve the prognosis, reduce the level of disability and increase the duration and quality of life.

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